WARFIGHTER SOLUTIONS

CRANE DIVISION, NAVAL SURFACE WARFARE CENTER
JULY 2007
Harnessing the Power of Technology for the Warfighter

Providing Agile Rapid Response Solutions

SPECIAL MISSIONS

WARFIGHTER SOLUTIONS

IN THIS ISSUE

This issue zeros in on the second of four new Focus Areas at Crane Division, Naval Surface Warfare Center (NSWC Crane) - Special Missions.

Crane listens to the Warfighter, and responds to their needs with solutions. From requirements development to acquisition, testing, fielding, and training, Crane employees deliver the full package!

Meeting and even exceeding deadlines is par for the course. Crane provides solutions as quickly as possible, because a life may depend on it.

Continuous Improvement is a key enabler to providing effective and timely solutions. Crane's Lean Team has saved thousands of dollars for the Warfighter by providing leaner, more efficient working environments.

Special Missions is home to two of the Navy's Technical Warrant Holders, or 'Technical Experts.' In this issue, you'll learn how these experts, along with the hundreds of dedicated, hard working employees, ensure Crane is providing the right capability, at the right time and at the right cost.

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www.crane.navy.mil

Warfighter Solutions is Crane's official newsletter. *Warfighter Solutions* communicates the many ways that Crane supports the Warfighter. The Editor/Illustrator can be contacted at 812-854-5674, or e-mail: jamie.wagler.ctr@navy.mil. For assistance, support, or further inquiries concerning Crane, call the NSWC Crane Information Line: 800-798-2204.

Words On Special Missions

It is with great pleasure that I help kick off the Special Missions Edition of *Warfighter Solutions*. I believe you will find the edition to be filled with very interesting and relevant examples of how the men and women of NSWC Crane provide vital support to our Warfighters. You'll see how we provide immediate support to current operations throughout the world as well as examples of how our involvement will serve to increase the readiness and capabilities of the Warriors of the future.

I'd like to devote some time to define the term "Special Missions" and to describe why we at NSWC Crane have elected to emphasize our Special Missions support role as a strategic Focus Area.

First, what do we mean by the term "Special Missions"? We use this term to describe the activities of our specialized and conventional forces in the areas of Special Operations, Irregular Warfare and Expeditionary Operations. Specifically, these forces are called upon to deal with a wide variety of threats and situations including riverine operations, counter-insurgency operations and combating terrorism.

Why do we consider Special Missions as a Focus Area for Crane? The answer is simple. The needs of forces engaged in these types of operations require specialized equipment and unique skills that reside here within NSWC Crane. Along with our partners, we have capabilities in the areas of special munitions & weapons, sensors, communications, mobility & maneuverability, as well as operational and equipment-related training. We have a proven track record of rapidly transitioning technologies to the fleet and to the field in these key areas. We at Crane make an immediate and substantial contribution to our Nation's readiness within the Special Missions arena.

We have every indication that Special Missions will continue to have a major role in both current and future military operations, and Crane is uniquely positioned to contribute to the success of these very important mission areas.

Enjoy this edition of *Warfighter Solutions*…and keep these "Special Warriors" in your thoughts and prayers as they continue their vital work in defense of our Freedom!

MR. DON SCHULTE
FOCUS AREA CHAMPION,
SPECIAL MISSIONS;
NSWC CRANE

FROM THE JOINT MISSIONS OFFICE DIRECTOR

As a critical provider of products and services to the Special Missions community, Crane employees take great pride in their work - delivering the best products possible to the sons and daughters supporting this nation. I believe that our continued success in supporting our nation's Special Operations Forces (SOF) is dependent upon four fundamental themes: our responsiveness and agility to their requirements; being the best-value provider of products and services; reinforcing our reputation for effective execution; and the significant impact that Crane's products and services have in support of SOF missions.

Crane is extremely responsive to the needs of the Warfighter. From requirements to fielded solutions, no one is faster or better. Not only is Crane's acquisition and fielding of hardware rapid, but so is the engineering of solutions and the insertion of technology. Crane is a one-stop-shop for the Warfighter, providing full life-cycle support for their technological needs. Crane's SOF Support Teams are in place to provide direct, accessible support to tackle every problem with speed and agility.

Crane's full life-cycle support business model and culture of continuous improvement are ideal for capturing every opportunity to increase value and decrease costs to our customers. When you couple this with our extremely competitive labor costs, Crane is unmatched at delivering efficient and cost-effective solutions.

Meeting the demands of the SOF community is extremely challenging (as well as extremely rewarding), but Crane's employees are up to the task, ensuring our Warfighters are well-equipped with everything they need to be successful. Crane leverages the knowledge of these Warfighters to learn first-hand what real needs exist. Listening to those who truly use the products enables a quick turnaround that meets those needs.

Crane is aligning our organization and expertise to provide the most effective full life-cycle support for product areas that have a critical impact on SOF missions. These include Sensors & Communications, Weapons & Munitions, Mobility & Maneuverability, and Training. In the pages that follow, you will see several examples of the agile and effective solutions that Crane has developed in these areas.

In this issue of Warfighter Solutions, I hope that you will gain an increased understanding of Crane's support of and dedication to the Special Missions community, and the critical role we have in getting cutting edge technology into the hands of these Warfighters.

MR. GREG REECE
JOINT MISSIONS OFFICE DIRECTOR, SPECIAL MISSIONS; NSWC CRANE

The

Article By: Greg Reece, 812-854-4156, gregory.reece@navy.mil

NSWC Crane is gaining tremendous value from a growing partnership with the Indiana National Guard (ING). The objective is to accelerate the fielding of solutions to our Warfighters by creating a "one-stop-shop" for engineering; acquisition; developmental and operational testing; Tactics, Techniques and Procedures (TTP) development; training, and sustainment.

By accessing the world-class test and training facilities at Camp Atterbury and the Muscatatuck Urban Training Center (MUTC), Crane's engineers, scientists and technicians are able to compress developmental and fielding times, reduce risk on equipment performance and suitability through operational testing, as well as increase their own technical capabilities through exposure to realistic operating environments. These facilities have recently supported testing of Crane products in the areas of weapons, electro-optics, advanced electronic attack, counter-Improvised Explosives Device solutions and unmanned vehicles. In most cases, the ability to do the testing at the nearby ING facilities avoided the necessity (and associated time and expense) of traveling and shipping equipment to distant test ranges. And in many instances, Crane's technical experts were able to draw on the knowledge of Warfighters with recent operational experience in the Global War on Terrorism (GWOT) to assess the military utility of equipment and systems. The end result of this collaboration is to transition improved technology to the field more rapidly, while assuring that it will perform "as advertised" when fielded.

Muscatatuck Capability

The centerpiece of this world-class test and training capability is MUTC. Sited on nearly 1,000 acres of land and including a 180-acre lake, the center's 68 buildings, with over 850,000 square feet under roof, range from single-level apartments to a five-story hospital. Included are a fire station, detention facility, water treatment plant, power station, school, church, warehouses, laundry room, office complex, and single and split-level homes. Basements, nearly 3000 meters of interconnected underground tunnels, and an internal nine-mile road network complete the package. The result is a full-immersion, contemporary, urban operating environment where both civilian and military organizations can learn to communicate, work together, and develop their expertise in urban operations. This environment also allows for test and evaluation, TTP development, and training on equipment and technologies in a realistic operational environment.

Just north of MUTC lies the 35,000 acre Camp Atterbury Joint Maneuver Training Center. With live fire ranges, from small arms/sniper and grenade to A-10 Thunderbolt aerial gunnery tables, along with an extensive maneuver training area and dozens of artillery and mortar firing points, plus forced-entry/breaching complexes, Atterbury provides tremendous flexibility for the testing of weapons, ammunition and special purpose munitions. Coupled with a new multi-building Joint Simulation Training and Exercise Center and military operations on urban terrain assault courses, Camp Atterbury is a tremendous asset for the test and evaluation of Special Missions equipment in a variety of settings and environments.

The Crane-ING partnership is chartered by a memorandum of understanding (MOU) which, in addition to giving Crane use of ING's ranges for product test and evaluation, also provides the Guard access to Crane for low-impact training – such as maneuver, vehicle convoy, and unmanned aerial vehicle operations. This provides an important capability for the Guard, due to the continuing high level of activity they are experiencing in support of GWOT at their facilities. For example, Camp Atterbury has trained and deployed more than 40,000 Warfighters from all services over the past two years, and was recently named one of six U.S. Army enduring mobilization stations.

Having already proven to be a valuable relationship for both Crane and ING, the level of teamwork between these organizations continues to grow. "Our partnership with the Indiana National Guard has created an unequaled national capability for rapid and effective development, acquisition and fielding of weapons and armaments, special purpose munitions, sensors and mobility solutions for our nation's special operations forces. Crane is absolutely committed to supporting ING. They, and the forces they are training and mobilizing, are on the front lines of the Global War On Terror." said Greg Reece, director of NSWC Crane's Joint Special Missions office. "The bottom line is that we have two very different commands – a Navy Warfare Center involved in developing, acquiring and fielding hardware solutions; and an Army National Guard training and mobilization center – both working very effectively together to leverage each other's strengths and better support our Warfighters," said Reece. ■

Ground Mobility Visual Augm

Article By: Kevin Coats, 812-854-3909, kevin.coats@navy.mil

NSWC Crane's Electro-optics Sensors Division is helping Special Operations Forces (SOF) obtain Ground Mobility Visual Augmentation Systems (GMVAS) in support of the Global War on Terrorism (GWOT). These systems will provide SOF operators the ability to navigate vehicles, conduct surveillance, detect, identify and track threats from Ground Mobility Vehicles (GMVs) in all light and weather conditions.

BACKGROUND

Crane's involvement in Special Operations multi-sensor system design, acquisition engineering, and life cycle sustainment began in 1997 with an assignment from Naval Special Warfare Development Group (NSWDG) and NAVSEA PMS 325 (now PMS- NSW) to provide Naval Special Warfare maritime surface combatant vessels with a day/night, high resolution, infrared imaging capability to augment existing optical and radar sensors. Following full and open competitive acquisition procedures, Crane awarded three contracts for system development with production options. Subsequent to extensive developmental and operational testing, and appropriate United States Special Operations Command (USSOCOM) milestone approvals, Inframetrics (FSI Boston) was selected to produce the Maritime Forward Looking Infrared (MARFLIR) system. The production and fielding phase began in 1999, and the systems were subsequently installed on three different Naval Special Warfare maritime platforms and later on two different Coast Guard cutters, which resulted in economies of scale cost savings. Crane holds the Technical Design Agent (TDA), Acquisition Engineering Agent (AEA), and In-Service Engineering Agent (ISEA) assignments for the MARFLIR system.

MARITIME SOLUTION APPLIES TO GROUND MOBILITY PLATFORMS

Shortly following the 9-11 disaster, the battlefield shifted to the desert and rugged terrain of Afghanistan and Iraq, and the need for ground vehicle mounted multi-sensor surveillance systems was born. The multi-sensor system previously developed for small maritime craft was a natural fit for ground vehicles because it was small, lightweight and extremely rugged. The power requirements of the system were also compatible with ground vehicles. Crane's Special Operations Night Vision project personnel began installing the maritime multi-sensor systems on ground vehicles for the Special Programs community. Crane also led two other major efforts to respond to this need.

- The first was a Pre-Planned Product Improvement (PPPI) effort to upgrade the Maritime Forward Looking Infrared (MARFLIR) system to provide more capability and adaptability to ground vehicles.
- The second was the development of the GMVAS Capabilities Development Document (CDD) to kick off an official Joint SOF program for GMVAS.

FUNCTIONAL EHNANCEMENTS LED BY SPECIAL PROGRAMS

The MARFLIR PPPI project conducted for USSOCOM PEO-SP, Naval Special Warfare Development Group and NAVSEA PMS-NSW, provided substantial improvements to the original MARFLIR system. Following two years of development by FSI Boston in partnership with Johns Hopkins University, and an extensive Crane led operational assessment (maritime, ground, and accuracy testing) in June and July of 2006, the High Performance Mobility FLIR (HPMF, AN/MAD-1) was approved for production by

mentation Systems (GMVAS)

USSOCOM PEO-SP in August 2006. The HPMF is a stabilized multi-sensor system containing an image intensifier camera, thermal imager, laser rangefinder, and laser pointer, with tracking capability, built-in Global Positioning System (GPS) antennas, and Inertial Measurement Unit (IMU) for completely autonomous geodetic target location capability. Crane awarded a $47 million Indefinite Delivery Indefinite Quantity (IDIQ) contract for this improved capability in support of USSOCOM PEO-SP. This improved ground mobility multi-sensor system will set the bar high for future technology upgrades for the new USSOCOM GMVAS program.

FORMALIZING THE REQUIREMENTS

In the second major effort, the Special Operations Night Vision project led the development of a Capabilities Development Document (CDD) in 2005 at the request of USSOCOM, which was staffed to all USSOCOM components and signed out by ADM Olson on July 18, 2006. This document established the formal requirements for forward deployed Special Operations Forces (SOF) for GMVAS in support of the Global War on Terrorism (GWOT). These systems will provide SOF operators the ability to navigate vehicles, conduct surveillance, detect, identify, track, and geo-locate threats in all light and weather conditions.

GMVAS consist of a collective set of three separate sensor modules, which can be mission configurable and interchangeable. The three sensor modules are:

- a driver navigation system (Driver GMVAS), which consists of bumper cameras and displays;
- a short range surveillance system (SR-GMVAS), which allows current and future hand-held imagers to be vehicle mounted with pan and tilt controls; and
- a long range mast mounted multi-sensor surveillance system (LR-GMVAS), which is stabilized with tracking capabilities.

The technologies to be utilized in these vehicle sensor suites are image intensifier and low light level charge coupled device (CCD) cameras, thermal imagers, millimeter wave or multi-spectral sensors, fusion of any combination of these sensors, laser pointers, laser rangefinders, laser designators, stabilization and geo-location components, and tracking software. The enhanced visual images will be transmitted to the navigator via a night vision compatible display or possibly a heads up display, which will be capable of fusing the images to provide optimal viewing.

PROJECT DEMONSTRATES CRANE'S SOF SUPPORT CAPABILITIES

Crane recently completed a project for a Ground Mobility Sensors/Weapons Platform. This project consists of a fully armored High Mobility Multipurpose Wheeled Vehicle (HMMWV) with a roof mounted weapons ring containing a crew served weapon, a thermal imager bumper camera (Driver GMVAS), a windshield mounted pan and tilt with a removable thermal imager (SR-GMVAS), and a mast mounted stabilized multi-sensor system (LR-GMVAS). This vehicle is fully functional, combat ready and is being used to demonstrate Crane's rapid combat integration capabilities in support of the Special Operations community. This will be an excellent means to communicate Crane's value to the Warfighter and relevance to Crane's Special Missions Focus Area.

In summary, Crane's Electro-optics Sensors Division has played a significant role in equipping our warfighters with the latest electro-optics technology. The GMVAS program is one of several ongoing programs being conducted at Crane to assist our SOF warfighters. Many of the SOF operations are conducted at night with this equipment which helps ensure mission success and save lives.

Operators

Article By: Troy Smith, 812-854-5858, troy.smith2@navy.mil

The phrase 'Operator Envisioned, Tested, Chosen' is the philosophy that the United States Special Operations Command (USSOCOM) has adopted in selecting and managing its new Assault Rifle program, the SCAR (Special Operations Forces Combat Assault Rifle). This philosophy has guided the program to involve the Special Operations Forces (SOF) Operator at every level from requirements generation, and participation in source selection, to continued assessments after contract award. Using this philosophy, along with the help of the gentlemen shown on the above right, the program awarded a contract to FN Herstal in less than ten months from solicitation issue (January-November 2004).

The SCAR provides an integrated, modular platform and consists of two "family" members; a SCAR Light (SCAR L) (5.56x45mm) and a SCAR Heavy (SCAR H) (7.62x51mm). These rifles share an 80% parts commonality and 100% ergonomics commonality. These traits will translate into less training, less logistical support, less costs, and more effectiveness for SOF. For greater flexibility, each of the family member rifles has the capability of using modular barrels of various lengths to provide greater adaptability to the SOF Operator over all ranges that the weapons will be utilized. The SCAR also provides a platform that can be exploited, due to its modularity for future enhancements in design and in small arms ammunition.

The program is managed by the SOF Weapons Program Management Office (PMO) at Crane Division, Naval Surface Warfare Center (NSWC Crane). NSWC Crane manages the entire life cycle of the program. It is envisioned that NSWC Crane will team with the Special Operations Forces Support Activity (SOFSA) for the sustainment of the program. The PMO/program continues to work closely with the SOF Operators, after contract award, to maximize the potential of the SCAR system. Since contract award, the program has had six Joint Design Reviews and three User Assessments. The program is currently in the Low Rate Initial Production (LRIP) phase. LRIPs are scheduled for delivery to NSWC Crane on February 25, 2007 with Initial Operational Test and Evaluation to follow. Upon delivery of LRIP weapons, the program will continually involve the operators by fielding weapons to USSOCOM units during the summer of 2007. This will allow the program to gain additional information on the performance of the weapon system.

Illustrated below are the SCAR L 5.56mm Carbine and the SCAR H 7.62mm Rifle. In appearance, except for the magazines, and minor dimensional differences, the weapons are virtually the same. Operation and manipulation of the weapons for the Operator are the same.

SCAR L 5.56mm

SCAR H 7.62mm

To emphasize, in addition to common features between calibers, each caliber platform allows modular application for the Operator. Within each caliber, the SOF Operator has the ability, through modular design, to tailor the weapon to best achieve mission capability. This is done by exchanging barrels of different lengths, which are made to better adapt

Rule

Joint SOF Operators performing shooting drills with SCAR weapons during EUAII & EUAIII

to mission requirements. This capability is achieved at the unit level, as performed by the Operator, which is a major change from previous weapon systems. In essence, the SCAR weapon does not leave the unit during its useful service life.

A further enhancement through the concept of modular design is the Enhanced Grenade Launcher Module (EGLM). The EGLM fires the traditional 40mm low-velocity ammunition utilized with the M79 and M203, which it will replace. Because it was considered during the design phase of the program, the EGLM was integrated with the SCAR weapons from the start. The same grenade launcher can be configured to mount to any version of the SCAR L, SCAR H, or be utilized as a stand alone system. The EGLM was tested at the same time as the SCAR weapons, making it available to the SOF Operator as an integrated system with the SCAR.

IN SUMMARY

Using the SOF envisioned, tested and chosen philosophy, the SCAR program has involved the SOF operator at every step. The program awarded a contract in less than ten months after issuing a Full and Open competition solicitation. This program will provide USSOCOM with an integrated, modular family of weapons with the capability of adapting to future improvements in small arms ammunition. In order to ensure maximum commonality (parts and ergonomic), the program is developing the SCAR L, H and EGLM concurrently. The program will field these systems concurrently as well, providing the SOF Operator with tremendous increases in Operational Effectiveness. ■

SOF Operator Shooting EGLM while mounted on SCAR L at EUAII, Oct 2005

COUNTER SNIPER SYSTEM SAVING LIVES – FROM CONCEPT TO PRODUCTION IN 82 DAYS

Article By: Jamie Wagler, 812-854-5674, jamie.wagler.ctr@navy.mil

Crane Division, Naval Surface Warfare Center (NSWC Crane) turned an Air Force requirement into an operational prototype and delivered it to the Warfighter in 42 days – concept to production was merely 82 days! The Counter Sniper System mounts to the top of the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and is designed to provide protection for the gunner from fire while the gunner protects the crew onboard.

"We needed something to protect our airmen from an emerging threat. Industry didn't have what we needed, so the Air Force Force Protection Battlelab turned to NSWC Crane for the solution. Crane's reputation for rapid prototyping and expedited product delivery, not to mention training and quality life-cycle support played into the decision to take the work to the Indiana base," said Col. Gerard Jolivette, U.S. Central Command Air Forces' director of force protection.

Don Lowe, an NSWC Crane employee serving as an on-site technical director with the Force Protection Battlelab, sketched the concept of the Counter Sniper System after the death of an Airman on Oct. 14th who was performing his duties as a gunner while assigned to the U.S. military police training effort in Iraq.

"Our Warfighters need to be as safe as possible on the battlefield. They need to feel reassured that they are protected from the insurgents as well as the harsh environment. This system is allowing that to become more of a reality," stated Lowe.

NSWC Crane built the dome-shaped prototype from ballistic steel and glass, while ensuring it would be versatile enough to fit any turret and durable enough to support

heavy weapons. The system's modular design is user friendly – the dome has three configurations, and can be easily reconfigured with common hand tools and minimum manpower.

The prototype was actually tested in Iraq by the Airmen of Detachment 7 security forces at Balad Air Base. "What better way to test a product than in the hands of the user whose life may depend on it," said Jolivette.

John Schneider, lead engineer for the project, NSWC Crane stated, "The reaction is positive – the Airmen say they feel safe. This project is rewarding – knowing that we're making a real difference."

On March 09, NSWC Crane was tasked to build additional Counter Sniper Systems for the Air Force. Crane Army Ammunition Activity (CAAA) is teaming with NSWC Crane to build and deliver all the systems by April 15. CAAA brings welding and machining to the table, and previously helped armor plate hundreds of HMMWVs for use in country.

Robin Cromwell, Crane's project manager for the Counter Sniper System, is looking for other applications for the system. "This system brings a greatly needed capability to the men and women serving in our Armed Forces. We are doing everything we can to ensure that our Warfighters have the absolute best equipment available to them." ■

"Crane's reputation for rapid prototyping and expedited product delivery, not to mention training and quality life-cycle support played into the decision to take the work to the Indiana base," said Col. Gerard Jolivette, U.S. Central Command Air Forces' director of force protection."

SPECIAL OPERATIONS FORCES RECEIVING REVOLUTIONARY SMALL ARMS AIMING CAPABILITIES TO HELP WIN THE GLOBAL WAR ON TERRORISM

Article By: Barry Gatewood, 812-854-3842, barry.gatewood@navy.mil

Only weeks after the events of 9-11, Congress provided United States Special Operations Command (USSOCOM) with an un-requested plus-up for $1.5 million in Research and Development dollars. The plus-up was titled "Miniature Day/Night Sight (MDNS) Development." Congress placed the funding in the Special Operations Peculiar Modification (SOPMOD) for the M4 Carbine Program, which was previously established at NSWC Crane to provide standardized aiming and target acquisition systems for small arms. This launched the SOPMOD program into the rapid development of the next generation of small arms aiming accessories for Special Operations Forces (SOF). After clarification of Congressional intent through the USSOCOM Washington Legislative Liaison Office, it was determined that the MDNS Development Project had multiple Congressional sponsors and industry constituents, representing a variety of weapons aiming devices.

The MDNS Development Project is now providing these next-generation capabilities for target acquisition, fire control, aiming, and aiming support subsystems. The subsystems now going to combat improve upon current capabilities through miniaturization, ruggedization, and combination of multiple capabilities into single items. The SOPMOD Program provides standardization across the joint SOF Community and cradle-to-grave management. Since MDNS is a developmental effort, new and combined capabilities as well as improvements on existing capabilities are involved. The intent of the MDNS Development Project effort was to rapidly develop, test, and field subsystems in a timeframe relevant to current conflicts.

In order to expedite the procurement process, the MDNS Development Project was designed to acquire subsystems requiring limited improvements, preferably only Engineering and Manufacturing Development (EMD), to become technically qualified and operationally suitable to enter

MDNS Development is a vital project, for additional weapons. The first the Special Operators in the

combat. Unlike the earlier first-generation SOPMOD Block I, which involved separate procurements of individual components, the MDNS effort was designed to provide a fully integrated target and acquisition system. With all components procured under a single requirements document, solicitation, and performance specification, each separate subsystem is designed to work optimally in conjunction with other MDNS subsystems. Additionally, the MDNS acquisition standardized various elements such as switches, intermounts, reticles, color, battery types, knobs, activation switches, and adjustment devices. Throughout the procurement process, the SOPMOD team was actively involved in an extensive system integration effort. The principles of Human System Integration were critical to the success of MDNS.

The MDNS Development specification was drafted after extensive Special Operations end-user deliberation and interaction in Program Integrated Product Teams (PIPT). NSWC Crane published a formal solicitation for proposals containing the initial specification, followed by months of public industry interaction. This interaction resulted in minor

adjustments and changes to the specification, which was approved for the joint SOF Community on April 10th, 2003, by the U.S. Army Special Operations Command (USASOC) G-8. Vice Admiral Eric T. Olsen, the Deputy Commander of USSOCOM, validated the MDNS Operational Requirements Document Annex in December of 2004. The four-phased acquisition process resulted in contract awards for each of the MDNS components.

The first items emerging from MDNS Development are the **Clip-on Night Vision Device – Thermal (CNVD-T)**, and the **Clip-on Night Vision Device – Image Intensification (CNVD-I2)**, which create an improved version of the AN/PVS-17A Miniature Night Vision Sight. MDNS allows production of the AN/PVS-17A to taper off, while production ramps up for the next generation of night aiming for small arms.

and will have many spiral developments MDNS products are already flowing to ongoing Global War on Terrorism.

The CNVD-T:

- designated as the SU-232/PAS Thermal Sight
- manufactured by Insight Technology
- includes a programmable reticle, digital/analog output, and electronic 1X-2X zoom,
- provides both a thermal clip-on capability, and a hand-held or stand-alone sight
- can be used to record and transmit video images.
- provides increased target detection capabilities and improved visibility through fog, dense foliage, rain, and extreme dark conditions.

The CNVD-I2:

- designated as the AN/PVS-24 Night Vision Device
- built by Litton Electro Optical Systems
- is a lightweight device that provides optimal target identification and recognition, and improved depth perception

The Clip-on Night Vision Device (CNVD) allows the operator to rapidly attach and detach the miniature night vision capabilities without disturbing the zero of the fundamental day scope. These new CNVDs are teamed with a new **Enhanced Combat Optical Sight for the Carbine (ECOS-C)**. Contracts are currently established with three vendors for three separate optical sights.

The ECOS-C:

- provides Special Operators with a dual-mission capable Dayscope that is superb for both close-range fighting and long-range engagements

1. The new system that will provide the next generation Dayscope is the **SU-230/PVS Articulated Telescope** built by ELCAN Optical, a division of Raytheon. The SU-230/PVS allows the Special Operator to select either a 1X or 4X magnified optic. The operator can also select either a red dot or ballistic drop reticle, both of which have variable illumination settings.

2. For sustainment purposes, a contract was awarded to Trijicon for the **SU-237/PVS**, which is an updated version of the popular Advanced Combat Optical Gunsight (ACOG). The SU-237/PVS updates the ACOG by providing a standard quick detach throw lever mount, flat dark earth-colored finish, and most notably, a miniature red dot sight mounted at the 12:00 position for improved quick sighting in close combat scenarios.

3. The third sight offered by MDNS is the **SU-231/PEQ Holographic Weapon Sight** manufactured by EOTech, a division of L3 Communications. The SU-231/PEQ differs from EOTech's standard commercial and military sights in that it operates on DL123 batteries, contains ruggedized electronics suitable for all small arms in the SOF inventory, and is built with a standard quick detach throw lever mount specifically designed for improved durability and boresight retention.

Each of these three new optical sights occupies distinct niches in the Special Operations mission profiles and requirements.

The revolutionary **LA-5/PEQ Advanced Target Pointer Illuminator Aiming Laser (ATPIAL)** represents the latest in laser technology for MDNS. This new capability provides a miniaturized combination of capabilities found in the earlier AN/PEQ-5 Carbine Visible Laser, and the AN/PEQ-2 infrared laser aiming systems. Some improvements to the LA-5/PEQ were made after the original contract award by teaming between the SOPMOD team and vendor.

CONTINUED FROM PAGE 13...

The LA-5/PEQ ATPIAL:

- provides the combatant with both visible and infrared aiming lasers and illuminators
- has a hardened intermount for improved durability
- has a newly incorporated capability for IFF - an embedded signal for identification of friend/foe
- possesses a spiral development capability for wireless remote activation and increased power.

The third generation Visible Bright Light was awarded to Insight Technology for the **SU-233/PVS Gun Light**. The MDNS contract also provides a line item for Insight Technology's SU-238/PVS Gun Light. The SU-238/PVS differs from the SU-233/PVS by providing an integrated visible aiming laser.

The SU-233/PVS:

- provides over 100 lumens of light in a small, durable package

Another MDNS item is the **Second Generation Rail Interface System**, which improves upon the current rail interface system by providing a "floating rail" concept.

The Second Generation Rail Interface System:

- provides improved rigidity (no loss of zero due to rough handling)
- allows independence from the M4A1 Barrel (no interference with the natural harmonic vibrations of the barrel during firing, and a capability for mounting grenade launchers independently from the M4A1 barrel).

Continued success in Developmental Testing and User Assessment has established strong support of the MDNS effort by Special Operations users and Commanders; over $183 million in procurement funds have been planned for current and future MDNS procurement. USSOCOM approved an Acquisition Decision Memorandum on May 30, 2006 to authorize the program to transition from the R&D phase to full rate production. Delivery of production systems began in the fall of 2006, with initial Total Package Fielding later in the winter of 2006-2007.

The MDNS Project is resulting in the extensive fielding of an entire new generation of ground combat aiming systems for U.S. Special Operations Forces. MDNS Development is a vital project, and will have many spiral developments for additional weapons. The first MDNS products are already flowing to the Special Operators in the ongoing Global War on Terrorism. ■

Diversionary Charge Replacement – Warfighter Safety

Article By: Teresa Reed, 812-854-2612, teresa.reed@navy.mil

The MK 141 Mod 0 Diversionary Charge is a pyrotechnic device used to disorient and confuse the enemy by producing a bright light and loud sound, thus creating a diversion. Military personnel utilize the Mk 141 Charge in Iraq and Afghanistan to support their everyday missions. The item was designed to be a low hazard device, producing a minimal amount of smoke, while generating an intense flash and sound report. It has been in service since 1999, and is utilized by Warfighters in all of the services, as well as the Federal Bureau of Investigations (FBI) and the Secret Service.

FIGURE 1

FIGURE 2

While serving its purpose for many years, the device does not go without its need for improvement. The device is 1.750 inches in diameter and 5.0 inches in height. Due to the lightweight polyurethane body and plastic fuze head, the device is not strong enough to penetrate window panes. Additionally, it is not waterproof, which is a growing requirement among the services. Increased usage has led

to reports of several mishaps with the Mk 141 Charge. The device is effective, but unforgiving of operator error.

Many of these mishaps have resulted in hand injuries to operating personnel, so a replacement device was sought to reduce the severity of injury while maintaining the performance requirements. Ultimately, the MK 141s were suspended from use, which resulted in an urgent need for a replacement device.

NSWC Crane performed a Market Survey for existing products that meet the enhanced performance and safety requirements. The project objective was to assess diversionary charge products currently on the market with features required by the users. The product that met all specified requirements and performed best overall was the Bottom-Top Vent (BTV-1) Diversionary Grenade, manufactured by NICO Pyrotechnik (Figure 2).

The BTV-1 functions in the same manner as the MK 141 and other grenade type devices - the main difference is the direction of energy in the BTV-1 shoots through the top and bottom vents versus through the side of the body like the MK 141. With the exception of the sealant covered disks over the output chambers, the BTV-1 remains intact, thus eliminating any fragmentation issues. Further, the BTV-1 remains stationary on the ground following ignition.

NSWC Crane was tasked to evaluate the BTV-1 and Final Type Qualify the device for use by all services. Human Effects Testing conducted by NSWC Crane confirmed that the configuration/ design of the BTV-1 added a significant reduction in the severity of an injury in the event of a mishap. As indicated in Figure 3, the gelatin model hand in the center shows only minor burns following activation of the BTV-1 round. The gelatin model hand on the right shows dramatic damage that can be caused by a round similar to the MK 141 round igniting in the hand.

NSWC Crane engineers collaborated with NICO engineers to provide even more protection when using the BTV-1 than shown in Figure 3. The body of the device was extended from its original design by one, shown in Figure 2, further protecting the user by limiting the possibility that their fingers would cover the top or bottom portion of the device while functioning.

FIGURE 3

NSWC Crane was instrumental in working with other ordnance safety activities to quickly obtain a limited release of the BTV-1 which was approved by the Weapons System Explosives Safety Review Board (WSESRB) in February 2006. A joint service Army Fuze Safety Review Board/Fuze & Initiator Technical Review Panel presentation was held at ARDEC, Picatinny, NJ, in March 2006, based upon an Urgent Material Release issued in April 2006.

Qualification testing of the device is soon to be completed, and WSESRB presentation is anticipated in October 2006. The engineering work and teaming effort will help prevent severe injuries to our Warfighters if mishaps occur. ■

The engineering work and teaming effort will help prevent severe injuries to our Warfighters if mishaps occur.

The Navy's New Irregular Naval Expeditionary

Article By: Scott Johnson, 812-854-5081, willard.johnson@navy.mil

The Global War On Terrorism has resulted in a renewed focus on small scale engagements, urban warfare, unconventional battles, force protection, and what the Department of Defense (DoD) now calls "Irregular Warfare." A major component of this warfare involves the use of small riverine craft and vehicles to engage enemy units on the rivers and coastal areas similar to the Vietnam era. Since the end of the Cold War, much of the equipment and expertise required for this type of warfare has aged. Consequently, military leaders, at home and abroad, have expressed the urgent need for a new riverine force. To restore this capability, and support Naval Anti-Terrorism and Force Protection (AT/FP), the Navy officially established the Naval Expeditionary Combat Command (NECC) on January 13, 2006 under the leadership of Rear Admiral Donald Bullard.

NAVAL EXPEDITIONARY COMBAT COMMAND (NECC)

The new NECC consolidates current missions and functions from several areas including: Naval Construction Division, Naval Expeditionary Logistics Support Force, Naval Coastal Warfare Units, Maritime Force Protection Command, Seabees, and Explosive Ordnance Disposal units. NECC will serve as the functional commander in control of training, manning, equipping, and organizing the forces required to conduct and execute ATFP missions. The initial focus of NECC is the establishment, training, and deployment of three riverine squadrons, which will have as many as 12 boats and 200 personnel each. Over the next two years, the NECC will grow to as many as 50,000 Sailors and will establish a new River Combat Force, which will assume maritime security operations on the Iraqi rivers and waterways. These Sailors will be transitioned from traditional duties under a significant reorganization that will permit the Navy to conduct operations on land and close up in the shallow water environment.

NSWC CRANE SUPPORT – ENDLESS POSSIBILITIES

NSWC Crane has already provided significant support to the first riverine squadron (RIVRON ONE) by delivering Small Arms Weapons to be installed on the boats, procuring ammunition, providing Night Vision and Electro Optic equipment, as well as Remote Operated Small Arms Mount support. Crane will soon be providing in-house weapons training to the Sailors assigned to the riverine squadrons. NECC support falls under Crane's 'Special Mission' Focus Area.

Some of the equipment already provided to RIVRON ONE include: the GAU-17 7.62mm gatling gun and the M2HB .50 caliber machine guns, both of which are being mounted in various locations on the craft. NSWC Crane also coordinated the safety certifications of these installations with NOSSA and the Weapons System Explosives Safety Review Board. NSWC Crane has also

Warfare Force, Combat Command

delivered PVS-14 and PVS-18 Pocket Scopes that can be either hand-held or helmet-mounted devices for forward observation, intelligence gathering, or photography.

NSWC Crane will be involved in the growth and future support to NECC in several technology areas including: ground mobility, surface water craft, Unmanned Aerial Vehicles, gun ammunition, and C4I equipment. A Community of Interest for NECC, under the leadership of NSWC Panama City's Technical Director, Dr. Ace Summey, was established across the Warfare Centers with representatives from Crane, Dahlgren, Carderock, and Panama City .

NSWC Crane has a primary mission to support the wide variety of units and elements of the new NECC in its role in the Global War On Terrorism. Crane has a broad range of capabilities from Night Vision/Electro-Optics, weapons, communications equipment, batteries, weapons training, chem-Bio detection, and pyrotechnique smoke screening as well as experience in expeditionary vehicle and surface craft. The Crane future strategy has established NECC as one of the main five areas which also falls into the Special Mission Focus Area as a priority element in the support of GWOT. It is Crane's role to help the NECC realign the current Navy Expeditionary Forces into a maritime force for security and warfighting capability. It is Crane's role to assist NECC in realizing its Mission and Objectives to realign forces, redistribute equipment, and recognize the need to grow current expeditionary capabilities to meet rising terrorist threats around the world.

U.S. SPECIAL OPERATIONS FORCES SOON TO REAP THE BENEFITS OF A WEAPON SHOT COUNTER

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Since the early 1990s, United States Special Operations Command (USSOCOM) has relied on Crane Division, Naval Surface Warfare Center (NSWC Crane) for the development, program management, and life-cycle sustainment of its Special Operations-unique small arms and weapon accessories. Guns have become the fundamental and decisive systems for Special Operations combat in the current Global War on Terrorism.

WEAR AND TEAR PREDICTABLE – BUT WHEN?

As with all mechanical devices, guns wear out with use, and Special Operations Forces wear out guns at a staggering rate. The rate at which a gun wears is directly related to the firing schedule for that particular weapon, specifically the number of rounds placed through the weapon and the cadence of fire.

From previous testing, data exists that indicate the approximate round count when certain part failures may be expected to occur. However, due to the large number of rounds expended in training exercises and actual combat, manually tracking usage rates would be an overwhelming and impractical task for an individual Special Operator. As a result, knowing a particular part failure and its corresponding round count is of little use to an Operator who cannot accurately determine the rounds on his weapon. For this reason, maintenance is traditionally performed on a time schedule instead of an actual usage schedule.

THE SOLUTION

A Weapon Shot Counter (WSC) would provide a means by which the operator would have insight into the round count. The WSC system originated as a concept from U.S. Navy Special Warfare Command during the late 1990s. Then, as at present, standard gages for barrel life were inaccurate and unreliable. The U.S. Navy SEALs had to have a better way of assuring that their guns were ready for combat. In 2001 and 2002, performance specifications were

drafted by Special Operations personnel in conjunction with technical personnel from NSWC Crane. The U.S. Congress also helped launch the WSC project when, in 2003, a plus-up was provided to USSOCOM for WSC Procurement. In December 2004, Vice Admiral Eric Olsen of USSOCOM validated the requirement for WSC capabilities for Special Operations Forces.

The WSC system consists of a WSC sensor, Data Collection Device (DCD), and maintenance software. The WSC sensor registers a shot by detecting the unique shock profile of live fire. The DCD allows the armorer to download such information as cumulative round and burst count from the WSC sensor into a maintenance system. The maintenance software system is used to record and indicate suggested maintenance activities after specified round counts are reached.

PREVENTIVE MAINTENANCE

The primary goal of the WSC system is preventing gun failures, such as a broken bolt or a burned out barrel. These failures, if not predicted and prevented, can result in the injury or death of a soldier during combat. Much has been done to improve the functionality of Special Operations weapons, but in comparison, little has been done to improve maintenance. Improving reliability through better maintenance could mean the difference of life or death for the Warfighter in the line of fire.

In the event of a part failure, the WSC will allow the armorer to know the round count at the time of failure. Much of the current failure data relating to round count is based on a range of values. For example, the M4A1 Carbine will experience barrel burnout between 4,000 and 6,000 rounds on a harsh firing schedule. With a much larger sample size, such as a force of 10,000 operators, more data will be available to make a better determination and narrow the range for a given failure, thus enabling better maintenance practices.

With current barrel gages for the M4A1 being only 60% accurate, there is a definite need for additional maintenance tools. The intent of the WSC is not to drive maintenance; rather it is intended to augment standard maintenance practices. The WSC maintenance system will not blindly dictate that a particular part has to be replaced; it will simply be another tool that the armorer can use to help in the determination as to whether a part may be in need of replacement.

ADDITIONAL BENEFITS AHEAD

Although the WSC is primarily needed as a preventive maintenance tool, the data collected during routine maintenance could be of an enormous benefit for logistics and sustainment as well. Currently, sustainment budgets are largely determined by past needs and best-estimate forecasts. As previously mentioned, the WSC will provide the actual round counts at which parts fail. Special Operations logistics organizations will view the weapon inventory of the entire force, note the number of weapons at a particular round count, and then plan sustainment accordingly. Using WSC data as a guide, large inventories of unneeded gun parts could be avoided and more timely deliveries of much needed parts can be planned. The WSC could also help determine the best sources for parts. Although testing is performed on all parts before a weapon is fielded, the information gathered from the WSC may help determine if one vendor product is actually superior to another.

Future weapon systems could also benefit greatly from the WSC. When a new weapon system is fielded, an abundance of failure data may not be available and needs may not yet be known. A WSC system could quickly provide necessary performance information.

Like an odometer on an automobile, the WSC provides an indication as to upcoming maintenance required for that particular weapon. By knowing the round count, the armorer can perform preventive maintenance instead of reactive maintenance. The reliability of the weapon will be enhanced, helping to insure the weapon will work properly when its function is most critical.

DELIVERY TO THE WARFIGHTER

Production began in early 2007. United States Special Operations forces will begin receiving WSC accessories beginning in late 2007. The WSCs will be deployed to Army Special Forces, Army Rangers, Navy SEALs, Air Force Special Tactics Squadrons, and Marine Corps Special Operations Command over the course of 2007 and 2008. These will be delivered in "Total Package Fielding" by a Fielding and Training Team, in which NSWC Crane participants will teach installation and use of the WSC to Special Operations Armorers. Future spiral developments are planned for other weapon systems.

FULL LIFE-CYCLE SUPPORT FOR

Article By: David Kuhlman, 812-854-1251, david.kuhlman@navy.mil

NSWC Crane serves as the "go to" engineering/logistic group for a variety of Special Mission pyrotechnic and demolition products. NSWC Crane provides rapid development and streamlined procurements to meet requirements for a unique group of Joint Special Operations Warfighters. With the on-going conflict in the Global War On Terrorism, timely delivery becomes even more critical.

NSWC Crane is often requested to assist in formalizing command requirements and establishing Program baselines for these unique requirements. These requirements can vary from NSWC Crane developing the original design to modifying a Commercial-Off the-Shelf (COTS) product in order to meet the command's requirement.

Figure 1 summarizes the comprehensive support that Crane provides for pyrotechnic and demolition products. After turning ideas into products, a series of performance and safety data points are collected, and additional input from the various subject matter experts are sought. Design safety recommendations from the Weapons System Explosives Safety Review Board (WSESRB) leads to acquisition action and ultimately fielding to the Warfighter.

Crane's support does not end with product fielding. It carefully manages inventory to control costs and seeks user feedback, including incident reporting and tracking, to ensure improvement of future products. Ultimately, products must be removed from the inventory at the end of their useful life through the demilitarization process. Crane offers full life-cycle support of fielded products. In order to expedite delivery of products to the Warfighter, prudent risks are often taken in agreement with program sponsors. For example, acquisition processes such as contracting for products often begin prior to receiving WSESRB approval. The risk is mitigated by having Crane engineers collaborate closely with Safety Personnel and WSESRB representatives to ensure that safety requirements are adequately addressed for any new design.

Time is also saved by combining as many tests as possible. Where feasible, a single Temperature and Humidity conditioning test is used for both Safety Series Testing and Operational Assessment Testing.

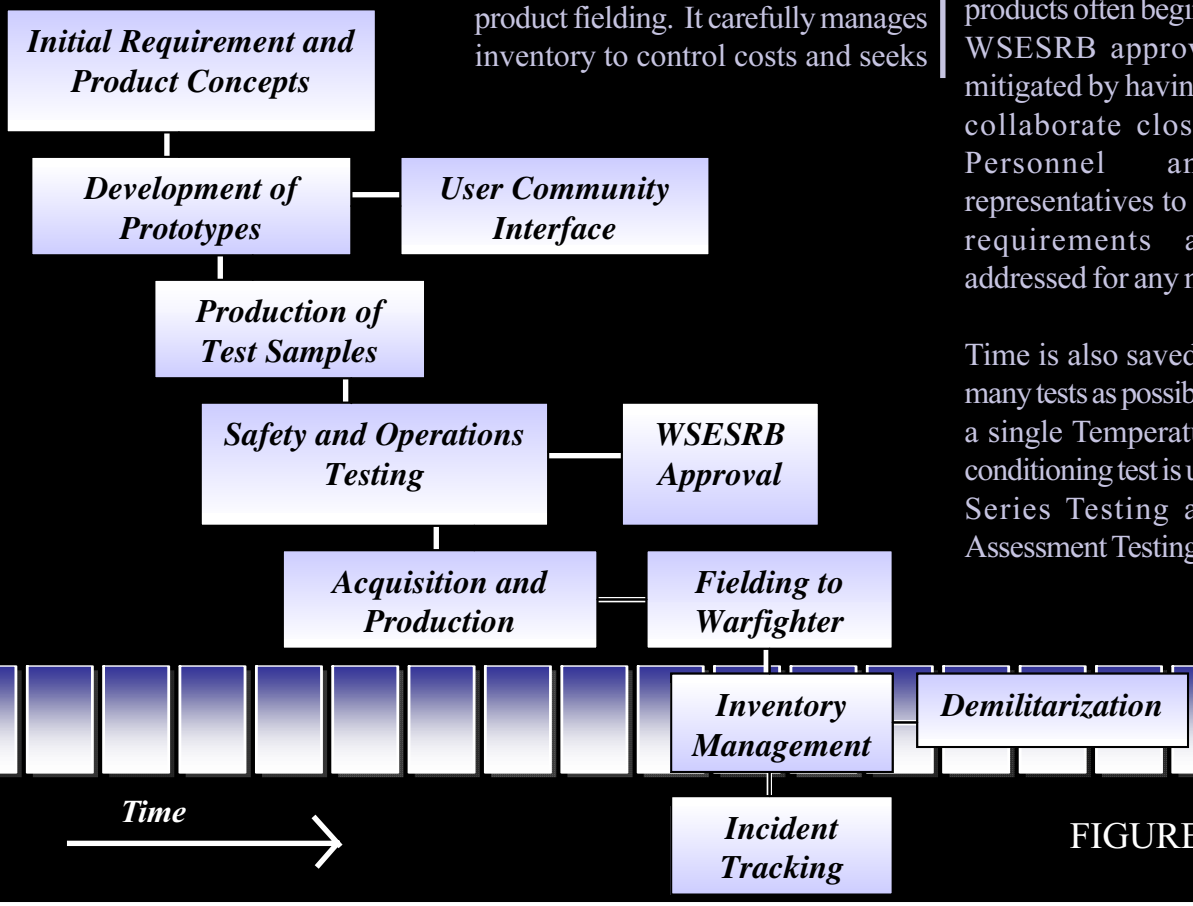


FIGURE 1

SPECIAL MISSIONS PRODUCTS

PRODUCT SUCCESSES

The **Mk 186 Mod 2 Remote Firing Device (RFD)** is an example of a commercial item that has been successfully adapted to military use. The initial version has been in inventory for approximately ten years and has recently been updated to newer technology. The updated version allows for remote firing of electric initiated materials from several miles away and can be reprogrammed at NSWC Crane to reduce maintenance costs. Another version is in the development pipeline that allows for remote firing of shock tube initiated demolition materials. NSWC Crane has collaborated with Rothenbuhler Engineering of Sedro Wooley, WA on the Navy specific design.

Sample Mk 186 RFD Components from Rothenbuhler Engineering

The **Mk 54 Mod 2 Hand-held Firing Device** is an example of an in-house design that has been improved to incorporate user community recommendations. The device is a hand-held shock tube initiator that allows for a multi-shot capability.

The **Mk 65 Time Delay Firing Device II (TDFD II)** is an example of a collaborative effort resulting from an unsolicited proposal from Raytheon in Indianapolis, Indiana. NSWC Crane has worked closely with the Naval Special Warfare Command and Raytheon Indianapolis to finalize the item design, obtain user feedback, and operationally test and qualify the TDFD II. The new item is expected to be fielded in the next fiscal year and will fill a critical special mission's need.

TDFD II

IN CONCLUSION

NSWC Crane is answering the call to field products rapidly to meet critical Warfighter needs. Whether the situation calls for an in-house solution or collaboration with industry or other government activities, NSWC Crane remains an innovative solution provider.

The Weapons Training Mission

Article By: Ronald Webster, 812-854-1871, ron.webster@navy.mil

Since the events of USS COLE and September 11, 2001, the military has been engaged in a Global War on Terrorism causing a renewed focus on small arms weapons and their accessories.

Since 1998, NSWC Crane has been teaching an Enhanced Operations & Maintenance course for small arms weapons used by the Naval Special Warfare (NSW) community. This course was developed due to the lack of formal small arms training within the Navy, the unique mission of NSW, and previously authorized maintenance levels were not meeting the needs of NSW to keep their small arms weapons mission ready. With the introduction of new maintenance authorizations and the training received during the three week course, NSW was able to dramatically increase weapons readiness.

With the start of Operation Iraqi Freedom, United States Special Operations Command (USSOCOM) saw a need for increased weapons operational availability. In June 2004, USSOCOM asked Crane to develop a joint training program for small arms weapons to support Special Operation Forces (SOF) weapons and the Special Operations Peculiar Modification equipment that is used on these weapons.

The USSOCOM Joint Training Program that has been developed consists of two projects. The USSOCOM Joint Armorer's Course stood up in January 2005, and the Program Executive Office (PEO) SOF Warrier Fielding and Training Team stood up in July 2005.

The Joint Armorer's Course was set up based on lessons learned from the NSW course and using existing curriculum for the same weapons. This course was originally designed to educate users about the SOF

weapons and complimentary SOPMOD equipment. After three months of teaching the course to U.S. Army and U.S. Air Force SOF personnel, the feedback on almost all critiques was to add service-common weapons to the course. In July 2005, USSOCOM asked Crane to complete a need and cost analysis for the addition of service-common weapons. This analysis was completed, and USSOCOM approved the addition of service-common weapons to the course. This class revision started in October 2006 and is now a two-week course.

The PEO SOF Warrior Fielding and Training Team was developed to provide new equipment training on SOF weapons and accessories as the items are fielded, and refresher training and weapons assessment is needed. This team has proven to be a huge success for USSOCOM in teaching soldiers the difference between SOF gear and Army gear and the proper logistics support for SOF. Since inception, the FTT has turned around over $1.5 million in broken equipment by either repair or replacement, increasing operational and mission readiness.

The training mission at NSWC Crane continues to grow. In May 2006, Naval Expeditionary Combat Command (NECC) asked the NAVSEA Small Arms Program Office to conduct a weapons maintenance study to evaluate authorized weapons maintenance they were conducting within their theaters of operation. This study was passed to NSWC Crane for execution and was completed in July 2006, with the recommendation to change the weapons maintenance authorization due to the environments in which they are required to operate and maintain their weapons. A plan of action and milestones were submitted with the report on the required tools, gauges, and training needed to support these new maintenance authorizations. It is expected this will be approved and lead to a new small arms weapons maintenance class being developed to support NECC in FY07.

IN SUMMARY

Due to NSWC Crane's expertise with small arms training and the ability to tailor training to meet specific needs of the War fighter, Crane has become valuable to many of the services throughout the DOD. Crane has provided training support to the Department of Energy, U.S. Coast Guard, and Defense Threat Reduction Agency. Crane's training successes are evident by the regular requests to provide training to additional organizations. ■

NSWC Crane Cont
Marine Corps/Ar

Article By: Kelly Richmond, 812-854-1118, kelly.richmond@navy.mil

NSWC Crane continues to support the United States Marine Corps (USMC) Systems Command (MARCORSYSCOM) as its Technical Direction Agent (TDA) for advancing Combat Identification Systems (CID) and identifying solutions to incidents of fratricide. Crane directly supports the USMC's Combat Identification Program Office.

Crane's roles as TDA for the Mounted Cooperative Target Identification System (MCTIS), are to assist in defining program concepts; perform system engineering to develop performance specifications; perform or direct research, development, tests and simulations to investigate solutions to problems; assess alternative technical approaches to identify the best programmatic approach; and to evaluate design agent achievements.

Crane's focus to date has been on evaluations of ground based, mounted, Battlefield Target Identification Device (BTID) systems. Crane has examined, developed, and prototyped systems from the following companies: Raytheon, Thales Missile Electronics, and Thales Communications, France.

The capability for, and benefit to the Warfighter results from efforts to provide ground-to-ground vehicles a cooperative CID capability to ensure real-time, situational awareness and eliminate Blue-on-Blue engagement, or fratricide.

A BRIEF TECHNOLOGY DESCRIPTION

The mission of the MCTIS BTID is to enable the crews of ground integrated weapons systems platforms to accurately and rapidly discriminate between friendly and potentially hostile vehicles, at ranges in excess of six kilometers. There is a 99% probability of correct identification in less than one second. USMC platforms include: the M1A1 Abrams main battle tank, Expeditionary Fighting Vehicle (EFV), and Light Armored Vehicles (LAVs).

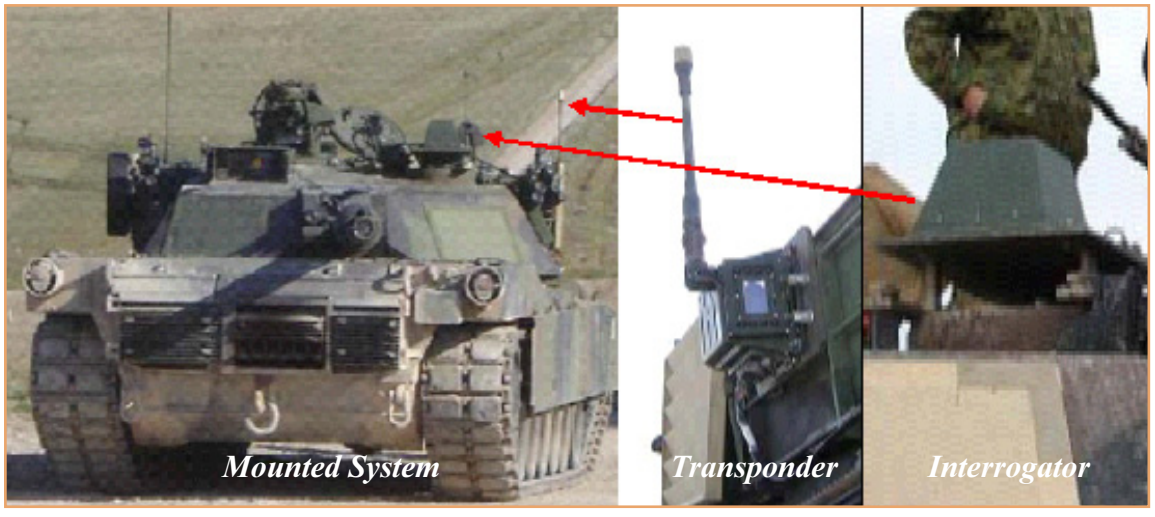
The system is comprised of two, basic components:

- an interrogator/antenna (to be integrated with a fire control system, laser rangefinder) and
- a transponder/antenna.

Weapon systems and reconnaissance platforms would be equipped with both components. Other combat and combat service support vehicles would only include the transponder/antenna.

To determine an unknown vehicle's disposition (friend/foe), an interrogator/antenna module would send out an electromagnetic wave pulse (encrypted millimeter-wave) in the direction of an unidentified vehicle. Queried vehicles equipped with the transponder/antenna would receive, decode the interrogation message, and respond with an encrypted answer – providing information on platform type, distance, etc.

The MCTIS BTID provides a Digital Data Link (DDL) capability to share identification and position location information and displays this on battle management devices such as the Mounted Digital Automated Communications Terminal (M-DACT) and Force XXI Battle Command Brigade and Below (FBCB2) - a



tinues to Support my CID Efforts

digital, Battle Command Information system that provides on-the-move, real-time, and near-real-time battle command information to tactical and combat support leaders.

The BTID could also interface with other existing technologies, such as the Command and Control Personal Computer, and relay information to Command, Control, Communications, Computers, and Intelligence structures to be distributed to other levels of command.

ADDITIONAL EFFORTS

CCID ACTD/

Exercise Urgent Quest

Over the past several years, Crane has also worked to support the U.S. Army's Coalition Combat Identification (CCID) Advanced Concept Technology Demonstration (ACTD). The CCID ACTD's goal was to assess both current and emerging combat identification solutions and associated Tactics, Techniques, and Procedures (TTPs) for the following mission areas:

- ground-to-ground (mounted - Battlefield Target ID Device and dismounted - Dismounted Soldier ID Device),
- air-to-ground (rotary wing and close air support - Radio Based Combat ID), and
- other mission areas in support of Joint, Allied, and Coalition operations.

The ACTD examined these technologies and doctrine under the most realistic operational conditions achievable, including urban operations and joint/combined operational concepts. The demonstration included a progressively demanding series of system integrations, technical tests, modeling and simulation events, and field exercises.

The ultimate goal was to prepare and complete a multinational Military Utility Assessment (MUA) from the culmination of the ACTD – Exercise Urgent Quest (UQ) exercise at Salisbury Plain, United Kingdom, September 19 – October 12, 2005, to determine how well systems can reduce incidents of fratricide during combat operations.

The results of the CCID ACTD CMUA were briefed to the Army/Marine Corps Board (AMCB) in March 2006, and resulted in a decision to pursue a joint acquisition strategy and funding in the service's POM 08-13 builds for the Battlefield Target Identification and Radio Based Combat ID technologies. Additionally, due to outstanding efforts from all involved, the event was selected (out of 75-80 ACTD/JCTD programs) as the ACTD/JCTD of the Year at the Annual ACTD/JCTD Managers Conference, Ft. Belvior, VA.

The results of UQ and Crane's testing of systems at the Indiana facilities will be evaluated to determine the most promising design approach that can be translated into an interoperable, supportable, and cost effective design and production system to satisfy the cooperative target identification requirements of the U.S. Marine Corps and Army.

Modeling & Simulation

Crane is also working on modeling and simulation efforts that will assist in the development of TTPs, concept of operation, and requirements for employing Combat ID technologies as well as seeking to optimize the balance between TTPs, Target ID, and Situational Awareness systems.

COLLABORATION EFFORTS

NATO/Coalition Program

The NATO Identification System Coordination Office provides coordination and support for NATO and multinational ID activities. NATO and multinational groups have made considerable progress towards the development of requirements, architectural documents, and Standardization Agreements (STANAGs).

Over the past several years, Crane has been a member of one such group - the Combat Identification Working Group (CIWG), which is responsible for defining user requirements for Combat Identification systems and develops technical solutions that meet those requirements.

The CIWG has developed the NATO Staff Requirement for BTID, and the CIWG technical arm has developed STANAG 4579, which seeks to define a system to meet those requirements.

U.S. Army and other DoD and Private Industries

Crane has continued working with the Army's Product Manager, Target Identification and Meteorological Systems (PM TIMS) under a draft MOU with MARCORSYSCOM and has been involved with testing of additional optical laser technologies for CID with the Army's Communications-Electronics Research, Development and Engineering Center, Intel and Info Warfare Directorate (CERDEC I2WD).

Additionally, Crane has also collaborated with the following facilities and companies:

- Picatinny Arsenal, ARDEC (Armament Research, Development and Engineering Center); and General Dynamics on engineering issues
- Marine Corps Training Systems Command (PM TRASYS) on modeling and simulation work

CONCLUSION

NSWC Crane continues support to the U.S. Marine Corps and Army Warfighters. Efforts are underway to prepare for a Milestone B decision bid/award for the combined service, BTID system. ■

TECHNOLOGY AND SPECIAL OPERATIONS TRAINING

Article By: Jeff Arnold, 812-854-6424, jefferson.arnold@navy.mil

In 1995, Naval Special Warfare (NSW) recognized a need to more effectively monitor their live-fire Close Quarters Combat Range (CQCR) facility. In addition, they desired an interactive range; one that would respond to trainee actions as they encountered various training threats in either reactive or purely scripted scenarios.

Enter NSWC Crane with a group of electronics design and integration engineers, programmers, and technicians. They designed and installed a comprehensive and reconfigurable system of cameras, sensors, and targets (CSTs) to help NSW realize their goal.

Since completion of that facility, Crane has designed, integrated, and installed active components at several facilities for other special operations and tactics groups throughout the Department of Defense and in the law enforcement community, including other NSW activities, the United States Marine Corps, and the Northeast Counter-Drug Training Center.

The key feature of Crane's work is the software, the critical enabler of each design, which provides integrated system control to make the facility truly interactive.

Trainers monitor student progress through the facility as they apply doctrinal tactics, techniques, and procedures. As trainers watch, they can turn and zoom cameras for a better view, or activate sensors and targets.

Low light capable pan and tilt cameras provide a huge safety benefit, as well. Having "eyes on" the trainees no matter where they are inside a live-fire facility truly mitigates risk. This is especially so when a cease-fire signal can sound throughout an entire facility at the push of a button. The ability to capture safety incidents on recorded video channels also facilitates subsequent investigation.

Gordon Miller is Chief Engineer for Crane's active indoor combat range efforts, overseeing design, installation, and system maintenance. He has been involved with Crane's efforts from the beginning and is currently working closely with the FBI's Hostage Rescue Team, and the U.S. Capitol Police to instrument their facilities.

As terrorist threats against the U.S. mount, many special operations and tactics groups are finding a need for real-time, realistic training. Crane is providing the technological solutions to their training requirements, thereby effectively *"Harnessing the Power of Technology to Support the Warfighter."* ■

REMOTE WEAPON SYSTEM CHOSEN FOR SHIPBOARD PROTECTION

Article By: James Ernest, 812-854-5776, james.ernest@navy.mil

The MK49 MOD 0 Gun Weapon System, also known as the Remote Operated Small Arms Mount (ROSAM) system, is intended for improvement of conventional small arms weapons fire mainly from naval platforms, but has shown capability in other environmental settings as well. The ROSAM consists of a two axis, gyro-stabilized weapon station containing a thermal imaging sensor and a daytime camera, as well as the mount structure to hold a weapon. The weapon station is typically mounted to a stand assembly that can be installed in place of a standard MK16 Navy tripod assembly. Several other components make up the ROSAM system that center around distributing power and command/control inputs and processes. NSWC Crane initially proved the concept of the value added with a remote stabilized weapon system, developed the performance specification for a competitive procurement, developed the acquisition strategy, procured the systems, and has teamed with NSWC Carderock, Norfolk Detachment in setting up logistic support and provisioning of the system.

FIGURE 1

Statistics of the Weapon System:

- Weight of the weapon station is 344 pounds
- Weight of the Total System as shown in Figure 1 is 640 pounds
- Capable of automatic tracking of a target allowing an operator to lock onto moving targets within a scene on the display without constant involvement
- Capable of 360 degrees coverage, but is usually limited in train by craft obstructions
- Can elevate up to 60 degrees, with depression angles of minus 20 degrees below the horizontal
- Capable of turning at 60 degrees per second
- Powered by 24 VDC at a maximum of 30 amps
- Capable of remotely charging and firing a conventional small arms weapon
- Currently configured to function with a M2HB .50 caliber machine gun; a MK19, MOD3 40mm grenade launcher; and a MK44 7.62mm Gatling gun system

Currently, 32 systems have been ordered with 20 of them already delivered. Platforms that the ROSAM have been used on include the MK V Special Operations Craft, the SPARTAN unmanned Rigid-hull Inflatable Boat, the Army Theatre Support Vessel, and a Defense Advanced Research Projects Agency/Carnegie Mellon University remote controlled ground vehicle. The system has been selected for use by Naval Sea System Command's PMS-480's Shipboard Protection System program, and by SP-11's Transit Protection System program for escort vessels. The ROSAM has also been modified to support directed energy weapons, other non-standard conventional weapons, and augmented with small missiles. ■

Lock, Stock, & Barrel I LOVE MY JOB!

Article By: Chuck Zeller, 812-854-5767, charles.zeller@navy.mil

By good fortune, I have been blessed to have the best job in the Naval Sea Systems Command. Selected for the position of the Navy's Technical Warrant Holder (TWH) for Small Arms & Weapons, my future work will be the most rewarding and relevant position anyone could hope for. This is a follow-on to having been entrusted in earlier positions with the responsibilities of engineering, testing, firing and procuring small arms weapons that are common throughout the Department of Defense and the United States Navy, as well as many small arms as secretive as those used by the fictional 007 James Bond. To say the least, I love my job. I love supporting the Warfighter, and am grateful and humble to be allowed to serve in this new position of increased responsibility.

Having served in the Weapons Division for almost 24 years, I am proud that NSWC Crane is recognized as the leader in Special Operations Weapons. The role of our small arms has increased dramatically beginning with the terrorist attack on the USS Cole on October 12, 2000, then geometrically accelerated after 9-11, and now continues to increase dramatically through the current day street fighting in Iraq. NSWC Crane has answered the call to increase the quality, lethality, and quantity of weapons aboard Navy vessels. At the joint level, we are entrusted to develop the next generation weapons systems to be used by our Soldiers, Sailors, Airmen, and Marines. This charge is profound…nothing less than ensuring that we provide the guns, ammunition, and sighting systems that will save our Warfighter's lives in gunfights, and kill or wound enemy formations until they break, flee, or surrender.

As technical warrant holder, I am charged many responsibilities, such as setting technical standards, safety, reliability, systems engineering, engineering stewardship, and integrity. Each TWH is expected to be the Technical Area Expert in their warranted area. However, none of us is omniscient, and we must be supported by a pyramid of experts in our area. NSWC Crane is the one-stop shop for engineering and acquisition of special mission weaponry. The engineering expertise at NSWC Crane provides a Technical Pyramid to rival those at Giza. The foundation of the Small Arms & Weapons technical pyramid is rooted in Crane's engineering expertise in Small Arms, Ordnance, Electro-Optics, and Failure Analysis. A large part of my new duties will be to foster this Technical Pyramid, not only to improve our current human capabilities, but to recruit new, highly-qualified members, such that the Small Arms & Weapons technical workforce of the future is ensured.

Not only does NSWC Crane have the most talented technical personnel, we have people that constantly think outside the box, challenge authority, and make the personal commitment to do what it takes to ensure the Warfighter is never in a "fair fight." Add to our human capabilities the Midwest work ethic and rural appreciation for firearms and you will see why Crane is an unbeatable workforce at an unbeatable location for Small Arms & Weapons technical work, for not only the Navy, but much of the DoD.

Safety and reliability are without question the two most critical issues when dealing with small arms. The men and women to whom we supply arms trust us with their lives. They trust us to ensure that the weapons we issue to them and train them on will fire and continue to fire under the harshest of conditions. The weapons and the ammunition they fire must be safe, even when overstressing the weapons beyond normal operating parameters. We owe them these basic considerations as they make sacrifices in support of our personal freedoms. Furthermore, we owe the Warfighters the respect to keep open lines of communication, as they are the end users of our products and are the quickest to learn the limitations of what we deliver.

Take time to talk to the Warfighters, visit them, understand their requirements, and then provide them the products and services to ensure they come home safely. NSWC Crane is performing admirably in the area of Special Missions. Keep up the good work and keep looking for opportunities to increase the Warfighter's superiority on the battlefield. ■

NSWC Crane Electro-optic Technology Support of Special Missions

Article By: Dusty Wilson, 812-854-5447, dustin.wilson@navy.mil

It is hard to believe that 20 years ago (January 28, 1986) many of us watched in disbelief as the space shuttle Challenger exploded before our eyes and claimed the life of its seven crew members. You may be wondering what this has to do with NSWC Crane or even Naval Sea Systems Command (NAVSEA), but it is very relevant in our support of today's Warfighter and winning the rapid paced Global War on Terrorism (GWOT). This unfortunate disaster is often used by NAVSEA leadership to convey how important it is that we insure Technical Authority is maintained throughout the life cycle of a system by placing safe, reliable and high performing systems in the hands of our Warfighters.

Yes, lives depend on the Special Missions equipment NSWC Crane supports! Their lives depend on reliable tools such as Electo-Optic (EO) devices in order to complete their mission. EO devices such as Visual Augmentation Systems (Thermal Imagers, Night Vision Image Intensification and Day Cameras), Laser Pointers and Target Designators, Weapon Sights, Infrared Countermeasures (IRCM) and Multi-Sensor Targeting Systems are in very high demand by Special Mission Warfighters across the globe.

Examples of Special Mission EO device usage include performing long range targeting for precision guided missiles, sniper shooting and small arms defense, piloting of multi-million dollar manned and unmanned aircraft, providing platform protection of heat-seeking missiles and performing covert night deployment and extractions in hostile environments and territories. Therefore, the importance of this technology across Special Missions and other Navy applications prompted NAVSEA to ensure that Technical Authority is maintained and that human capital resources are dedicated to maintaining Electro-Optic Technology.

NSWC Crane provides a team of over 300 EO specialists comprised of Scientists and Engineers, Technicians, Program Managers, Logisticians and Contract Specialists to deliver more than 15,000 EO Systems to the Warfighter each year. This dedicated team focuses on rapid technology transition and system delivery requiring short turn around times measured in days and months. NSWC Crane provides world-class specialized EO facilities to perform testing, modeling and simulation, design and development and acquisition and sustainment of EO devices to ensure safe and reliable products are fielded and maintained across DoD Special Mission Programs.

Technical Authority provides the framework needed to focus programmatic decisions around safety and reliability as well as cost, schedule and performance. It also provides accountability to a high level of authority within the NAVSEA chain of command for technical concerns. Most importantly, it gives the end user or customer a single belly button for technical advice and stewardship.

Technology is ever changing and Warfighter support today will be very different than support provided tomorrow. We must always be contemplating how the technology we work with in today's Navy will be transformed into the technology of tomorrow's Navy and the Navy after next. In addition, our processes must be transformed through constant Continuous Improvement in order to maintain the speed and agility necessary to support our Special Mission and other customers on time and at the right cost.

NSWC Crane provides a critical mass of EO technical support through leveraging a large volume of specialized facilities, equipment and personnel exercised across numerous DoD programs. NSWC Crane personnel understand what it takes to meet the unique needs of Special Mission Warfighters and offer objective insight for new EO and other technology development and usage. NSWC Crane provides a Center of Excellence for Electro-Optic Technology Solutions by conducting full spectrum R&D, Acquisition and Sustainment support to ensure the Special Mission Warfighter has the equipment necessary to complete their mission. ■

A-MANPADS - KEEPING LAAD BATTALIONS FLEXIBLE AND IN THE FIGHT

Article By: Christopher Brown, 812-854-1258, christopher.brown4@navy.mil

When the Marines crossed the Line of Departure at the beginning of Operation Iraqi Freedom (OIF), the Low Altitude Air Defense (LAAD) Battalions (Bns) crossed with Avengers to provide local air-defense. Eager to demonstrate their skills to the rest of the Marine Corps, the LAAD Bns were soon disappointed when no air threat presented itself. LAAD units were soon tasked with a secondary mission of convoy support. As more operations were supported, the Avenger's limitations came to the forefront. The Avenger had never been designed to engage ground targets, hence electronic and mechanical limits had been built into the system that now prevented it from fully completing its new missions. Additionally, the technology-dependent design did not handle the sandy environment well. Nor did the heavy turret allow for the already overweight Avenger to accept armoring solutions.

MARINE CORPS TASKS THE ISEA – NSWC CRANE

Realizing an imminent need, the Program Manager (PM), Air Defense Weapons Systems (ADWS), at Marine Corps Systems Command (MARCORSYSCOM), Quantico, VA, set forth in the LAAD Man Portable Air Defense (MANPAD) Transition Plan of Action and Milestones (POA&M), the requirement for a MANPAD combat system. This system would enable the effective deployment of the existing Stinger Missile system throughout the remainder of its shelf life and possess the potential to facilitate the fielding of a future missile system. Capitalizing on a long-standing technical relationship, PM ADWS tasked the Ground Based Air Defense In-Service Engineering Agency (ISEA), NSWC Crane, with the role of designing, testing, and building the Advanced Man Portable Air Defense System (A-MANPADS).

COMMUNITY TIES AND IN-HOUSE EXPERTISE - A PLUS

By leveraging in-house knowledge and capabilities, NSWC Crane was able to take A-MANPADS through an Abbreviated Acquisitions Program (AAP) to a fielded system within 15 months. With expediency, quality, and usability as the guiding tenets of the project, Crane began leveraging its strong ties to area small businesses, ordering parts, and designing and constructing components while simultaneously authoring the Analysis of Alternatives (AoA). This strong tie to the community allowed the team to have two working prototypes less than two months after submittal of the AoA.

Once the LAAD community had selected a final design, Crane began the engineering and development of four Production Representative Systems (PRS). To speed Developmental Testing and Evaluation (DT&E), the A-MANPADS team completed environmental testing requirements on-site. Additionally, the A-MANPADS team consulted other Crane professionals to alleviate various Stinger missile and crew-served weapons challenges. After successful completion of testing and evaluation, Crane completed a Safety Analysis Report (SAR), developed a manufacturing procedure, and set up a production line.

CRANE'S EXTENDED SUPPORT

NSWC Crane's role in the development of the A-MANPADS was not limited to engineering. Crane provided the logistical expertise to field the A-MANPADS that is fully supportable over the system's lifetime. Crane developed the Initial Support Items List (ISIL), the Logistic Support Analysis Record (LSAR), the Configuration Management Plan (CMP), the Technical Data Package (TDP), and the Technical Manual (TM).

When the first A-MANPADS were fielded, Crane's work on the project did not end. Crane remains the sole production facility, the Configuration Manager, and the A-MANPADS ISEA. Additionally, Crane developed and conducted the New Equipment Training (NET).

The A-MANPADS project has benefited greatly from the various initiatives that are currently shaping the future of Crane. Examples include Crane's Continuous Improvement efforts, and Human Systems Integration (HSI) initiatives. When requirements from the Warfighter changed, the production line was able to meet the additional needs through the successful application of Lean principles. Likewise, when a safety issue was identified with the crew-served weapon, the A-MANPADS team collaborated with the NSWC Crane HSI Committee to significantly reduce the probability of system damage or user injury.

Winner of the 2007 DoD Value Engineering Achievement Award -- Team Marine Corps - Advanced Man Portable Air Defense System Expeditionary Warfare Systems Division, Crane

THE A-MANPADS – A FULL PACKAGE

The A-MANPADS provides the Marines of the LAAD Bns with an expeditionary material solution for the execution of the short-range air defense and ground security missions. The A-MANPADS meets existing requirements as defined by Marine Corps Combat Development Command (MCCDC) as well as the operational needs of LAAD Bns deployed to OIF.

The heart of the A-MANPADS system is the AM General M1097A2 variant of the High Mobility Multi-purpose Wheeled Vehicle (HMMWV). The HMMWV has been fitted with a four door cab kit and a universal weapons station, both provided by AM General. Within the confines of the cab, a communications rack has been installed allowing the mounting of an AN/VRC-91 Single Channel Ground and Airborne Radio Systems (SINCGARS), a Remote Terminal Unit (RTU), and a Defense Advanced GPS Receiver (DAGR). The system includes a singular major component that is unique to this solution - the Missile Rack System (MRS). The MRS is an aluminum rack in the bed of the HMMWV designed to safely transport four Stinger Weapon Round Containers (WRC).

The four-door configuration provides ample room for the current two-man crew and their personal equipment. However, it provides the flexibility of switching to a maximum of a four-man crew if the Commanding Officer so chooses or the LAAD community directs a future manpower change. Additionally, the installation of the weapons station allows the Marines the option of mounting a crew-served weapon such as a 7.62 machine gun - the M240B, or a .50 caliber machine gun - the M2 Heavy Barrel (HB). The crew-served weapon can be utilized for self-protection against both air and ground. The design of the vehicle allows for the installation of the Marine Armor Kit (MAK) when the specific mission requires the modification to the vehicle.

DEPLOYMENT TO THE WARFIGHTER

Crane is building approximately 150 of the A-MANPADS vehicles at a rate of ten vehicles per month. The production team consists of government and contractor employees. Production of the first 42 A-MANPADS vehicles included the addition of the MAK, the installation of which was accomplished at no extra cost to the Marine Corps thanks to Lean practices being applied early in the production of the A-MANPADS vehicles. The first fielding of the A-MANPADS occurred in March 2006, with production expected to wrap up in June 2007.

During the development, production, and subsequent fielding of A-MANPADS, Crane has once again upheld its long tradition of supporting the Warfighter. From concept to construction, prototype to production, testing to teaching, and all the activities in-between, Crane has proved the ability and desire to serve the Warfighter in ever expanding roles and responsibilities. ■

WARFIGHTER SOLUTIONS

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CRANE DIVISION
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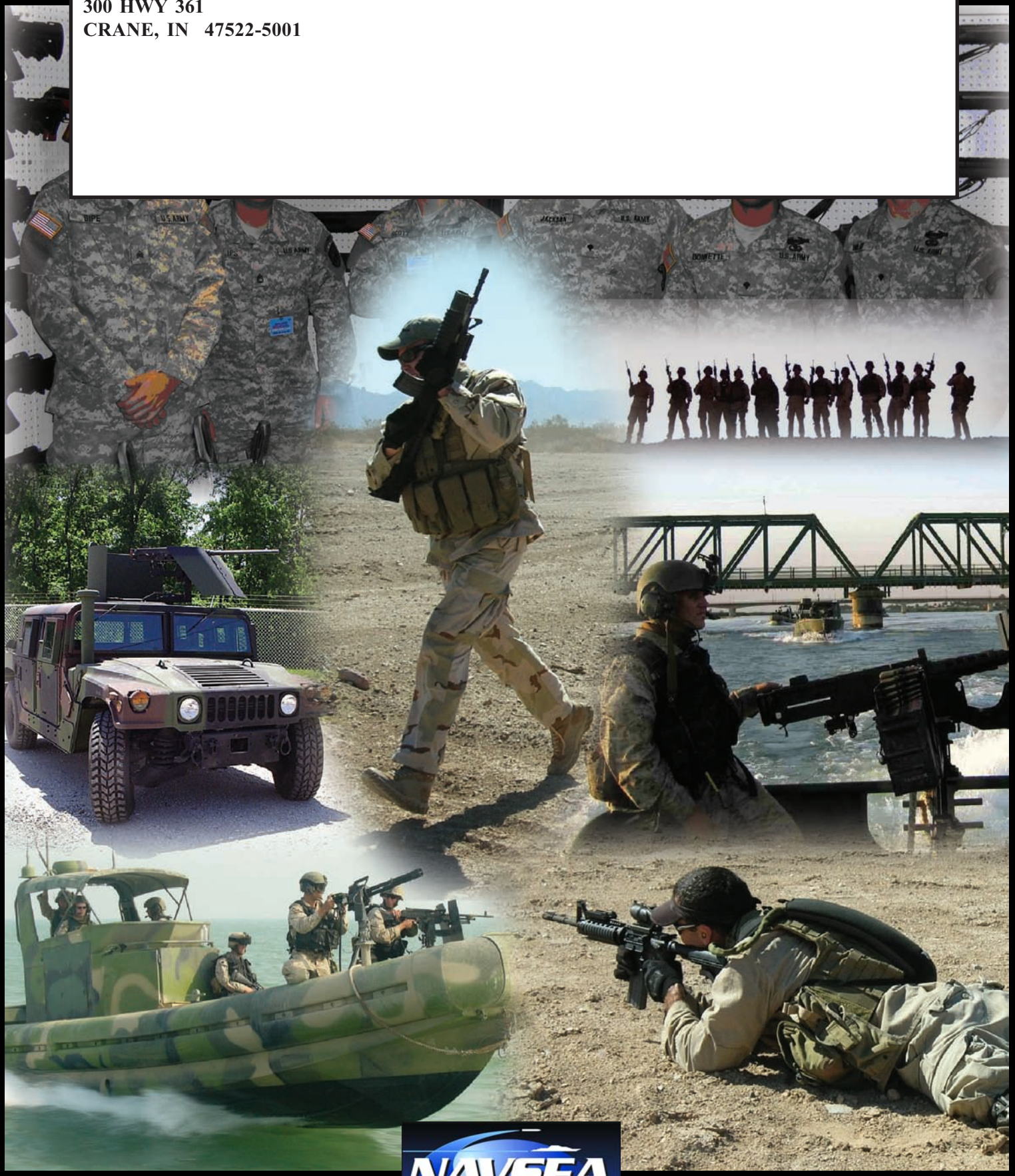
CRANE, IN 47522-5001



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